INTRODUCTION

Recovery Unit Designation

Designation of the Malheur Recovery Unit is based in part on the inclusion of bull trout of this river basin within a single Gene Conservation Group by Oregon Department of Fish and Wildlife (Kostow 1995). The delineation of the Gene Conservation Groups is supported by the baseline genetic analysis conducted by Spruell and Allendorf (1997). Their analysis found that Malheur bull trout belong in the "Snake River" group of populations, but are distinct from other Oregon populations within this group. Further analysis by Spruell *et al.* (2002 in press) indicate Malheur bull trout are more genetically similar to bull trout populations from the Boise (Idaho) and Jarbidge (Nevada) drainages than to other populations in Oregon, and these three populations form a cluster within the Snake River group. Figure 1 shows the Malheur Recovery Unit.

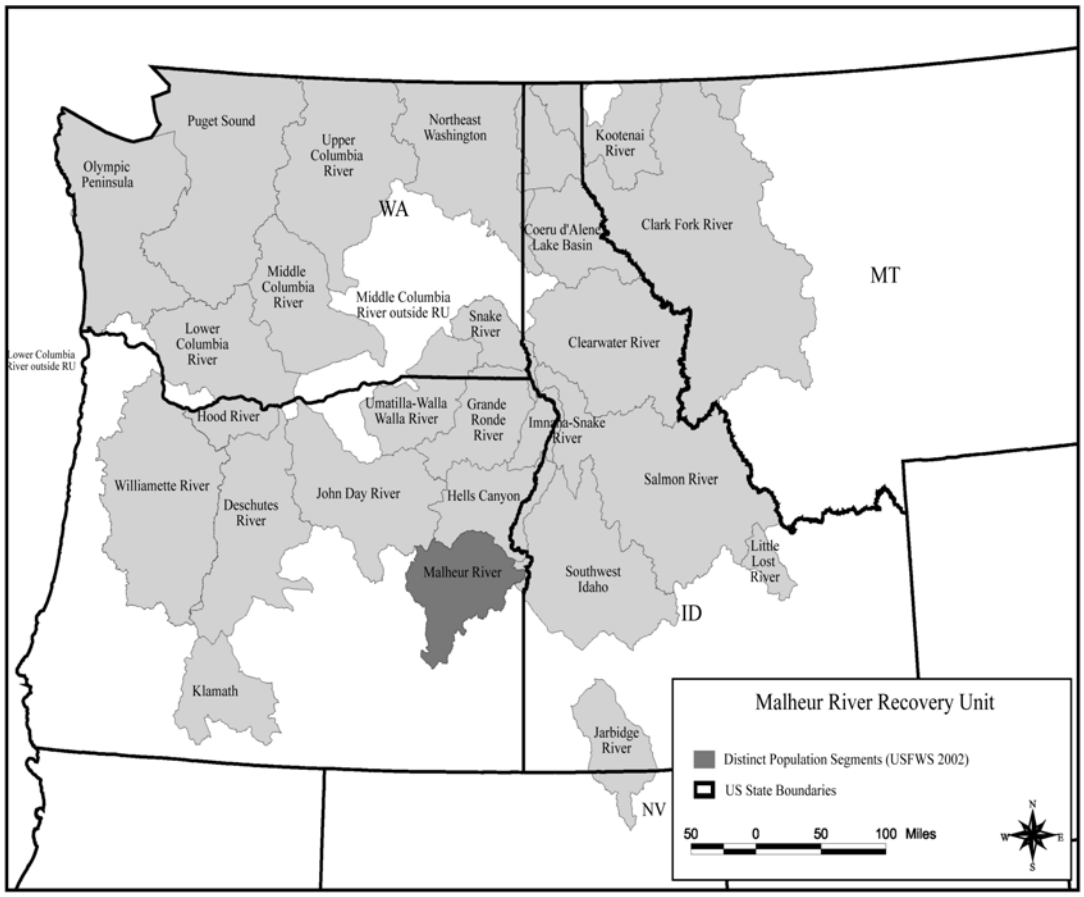
Geographic Description

The Malheur River Basin is situated in eastern Oregon bordered on the south by the Owyhee River Basin, on the north by the Burnt River and John Day River Basins, on the west by the Malheur Lakes Basin, and by the Snake River to the east, which it enters near Ontario, Oregon. The basin includes portions of four counties; 62 percent occurs in Malheur County, 27 percent in Harney County, and small areas in Grant and Baker Counties (Malheur-Owyhee Watershed Council 1999).

From its headwaters in the Strawberry Range, at the southern terminus of the Blue Mountains, the Malheur River flows southeasterly for 105 kilometers (65 miles), turning north for 12 kilometers (19 miles), then east near the town of Juntura and continuing east to northeast to its confluence with the Snake River near the town of Ontario, a total distance of approximately 306 kilometers (190 miles) (Malheur-Owyhee Watershed Council 1999). Major tributaries include the South Fork Malheur River, which enters from the west at river kilometer 191 (river mile 119) near Riverside; the North Fork Malheur River, which enters at river kilometer 154 (river mile 96) near Juntura; Bully Creek, which enters at river kilometer 34 (river mile 21); and Willow Creek, which enters at river kilometer 32 (river mile 30). The latter three tributaries all enter the mainstem Malheur River from the north. The most important of the tributaries in terms of bull trout is the North Fork Malheur River, which also originates in the Strawberry Range and flows south to its confluence with the mainstem Malheur. Total drainage area of the Malheur River Basin is 11,940 square kilometers

(5,000 square miles) (Malheur-Owyhee Watershed Council 1999). Elevations in the basin range from the highest point on Graham

Figure 1. Bull trout recovery units in the United States. The Malheur Recovery Unit is highlighted.



Mountain at 2,613 meters (8,570 feet) to 610 meters (2,000 feet) at the mouth of the Malheur River (Hanson *et al.* 1990).

Public ownership accounts for approximately 66 percent of the land in the basin, most of it (47 percent) managed by the U.S. Bureau of Land Management, while 13 percent is managed by the Malheur National Forest and 6 percent is State-owned land. The remainder of the basin is in private or tribal ownership. Special management areas on the Malheur National Forest important to bull trout include the Strawberry Wilderness Area in the upper Malheur River, the

Monument Rock Wilderness Area in the North Fork Malheur River watershed, and the Wild and Scenic corridor in the North Fork Malheur River. In 2000, the Burns Paiute Tribe acquired 712 hectares (1,760 acres) in Logan Valley. The property encompasses approximately 11 kilometers (7 miles) of waterways, including portions of McCoy Creek, Big Creek, Lake Creek, Frazier Creek, and Malheur River (L. Schwabe, Burns Paiute Tribe, pers. comm. 2002).

Geology/Topography. Geologic processes that have shaped the Malheur River Basin include vulcanism, uplift, faulting, erosion, deposition, and to some extent glaciation. The Strawberry Range in the northwestern portion of the basin is composed primarily of Columbia River basalt dating from the Miocene but older outcrops from rocks dating to the Jurassic are also present (Franklin and Dyrness 1984). Subsequent uplifting of the basalt followed by faulting, erosion and weathering processes during the Pliocene and Pleistocene resulted in a varied relief of ridgetops, mountain slopes, dissected canyons and valley bottoms (Franklin and Dyrness 1984; U.S. Forest Service (USFS) 1999a). However, the bulk of the landscape is dominated by more gently sloping plateaus of composed of Miocene and Pliocene beds of tuffaceous sedimentary rocks capped by flows of rhyolite and basalt (Franklin and Dyrness 1984) and dissected by the stream network. At the lowest elevations near the mouth of the Malheur River, the basin is characterized by more gentle topography of low elevation terraces composed of lacustrine sediments and floodplains extending up the Malheur River and Willow Creek valleys (Malheur-Owyhee Watershed Council 1999).

Climate. The climate in the Malheur River Basin is continental, characterized by long, hot summers and cold winters. Summer high temperatures average between 85 and 95 degrees Celsius and winter temperatures average in the 20s. Annual precipitation averages from 25 to 30 centimeters (9.8 to 11.8 inches), with most occurring during winter as snow. Brief, intense storms occasionally occur during summer (Malheur-Owyhee Watershed Council 1999).

Hydrology. Flows in the Malheur River Basin are dominated by meltwater from the mountain snow pack. Peak discharge occurs in the spring (May through June) with traditional low flows in the summer and fall maintained by groundwater inflows. Springs originating in the Strawberry Range maintain year-round flows to streams they feed, while streams originating elsewhere have flows that tend to be ephemeral in nature (USFS 2000). Summer storms can influence streamflows with short duration, intense increases in runoff and streamflow.

The highly variable annual flows of the Malheur River and its tributaries have been harnessed through construction of storage and flood control facilities

and major diversion structures dating from 1881 with construction of the Nevada Diversion Dam at about river kilometer 31 (river mile 19) on the lower Malheur River. Winter flows are stored to provide reliable flows during the irrigation season, primarily to agricultural areas in the lower river valley. Major storage reservoirs include Beulah Reservoir (Agency Valley Dam constructed in 1934 at river kilometer 29 (river mile 18) on theNorth Fork Malheur River), Warm Springs Reservoir (Warm Springs Dam constructed in 1919 at river kilometer 198 (river mile 123) on the mainstem Malheur River, often referred to as the Middle Fork Malheur River above Warm Springs Reservoir) and Bully Creek (1962) and Malheur Reservoir (Willow Creek) in the lower Malheur basin. The entire flow of the Malheur River is diverted at Namorf Dam, river kilometer 111 (river mile 69), for re-distribution in the irrigation network of the lower Malheur basin. Irrigation return flows and groundwater inflows account for streamflow downstream of Namorf Dam. Namorf Dam (also known as Harper Dam) is laddered.

Vegetation. Vegetation in the Malheur Basin follows an elevation gradient from shrub-steppe to coniferous forest as the elevation and moisture increase. At the higher elevations the forest community includes lodgepole pine (*Pinus contorta*), whitebark pine (*P. albicaulis*), and subalpine fir (*Abies lasiocarpa*). Mixes of grand fir (*Abies grandis*), lodgepole pine, Douglas-fir (*Pseudotsuga menziesi*), western larch (*Larix occidentalis*), Engelmann spruce (*Picea engelmannii*) and ponderosa pine (*Pinus ponderosa*) occur on middle elevation slopes. The historical forest of ponderosa pine at the lower elevations now includes mixes of ponderosa pine, Douglas-fir, and grand fir due to the suppression of fire (USFS 1999b). Where the forest transitions to the grass and shrubland vegetation characteristic of the Great Basin province, communities of juniper (*Juniperus occidentalis*) and sagebrush (*Artemisia spp.*) dominate with mountain mahogany (*Cercocarpus spp*.) occupying rocky ridgetops (USFS 1999a). The native vegetation in the lower river valleys has been replaced by crops sustained through irrigation. The most common hardwood species found along riparian areas include alder (*Alnus spp.*), willow (*Salix spp.*), aspen (*Populus spp.*), and cottonwood (*P. trichocarpa*). However, long-term impacts from livestock grazing and fire suppression, and increased browsing pressure from expanding numbers of big game, have limited their occurrence and condition (USFS 1999b).

Cultural/Social. For thousands of years, the Wadatika band of the Northern Paiute Native Americans have inhabited the area that includes the Malheur River Basin and spans central and southeastern Oregon. Their seasonal migrations took them to the upper Malheur River to harvest salmon, as well as other native flora and fauna (Burns Paiute Tribe, *in litt.* no date; Malheur-Owyhee

Watershed Council 1999). Diseases introduced by early settlers greatly reduced the native population and altercations with nonnative settlers led to the establishment of the Malheur Reservation in 1873. The 719,758 hectares (1,778,560 acres) of the reservation included Castle Rock, Strawberry Mountain, the North and South Forks of the Malheur River, and portions of Harney County. Continued invasion of the Malheur Reservation by settlers led to the Bannock Indian War and eventual disbanding of the reservation in 1883. Descendants of the Wadatika band make up the current Burns-Paiute Tribe. They occupy a 312 hectare (771 acre) reservation near Burns, as well as property in Logan Valley.

Europeans first entered the basin in the 1820's when fur traders came in search of beaver (*Castor canadensis*). Settlers followed later in the century with the opening of the Oregon Trail and discovery of gold and silver in the Owyhee River Basin. Ontario is the largest urban area with a population of 10,000, followed by Vale with a population of 1,800 (Malheur-Owyhee Watershed Council 1999). Smaller unincorporated communities pertinent to the discussions of bull trout include Juntura and Drewsey.

Land Use. Agriculture is the dominant land use in the Malheur River Basin, with livestock production occurring over the greatest area. Irrigated agriculture dominates economics although it occupies only 4 percent of the landscape (Malheur-Owyhee Watershed Council 1999). Timber harvest and recreation occur in forested regions of the northwest part of the basin. The forest also provides summer livestock forage. Some mineral extraction occurs in the basin, primarily of diatomite, but deposits of gold and mercury cinnabar are also known to occur in the basin (Malheur-Owyhee Watershed Council 1999). Public ownership accounts for approximately 66 percent of land in the basin divided between the U.S. Forest Service (13 percent), Bureau of Land Management (47 percent), and State-owned land (6 percent) (Hanson *et al.* 1990).

Fish Species. Species found in association with bull trout in the North Fork Malheur River include redband/rainbow trout (*Onchorynchus mykiss*), bridgelip sucker (*Catostomus columbianus*), coarse scale sucker (*C. macrocheilus*), redside shiner (*Richardsonius balteatus*), mountain whitefish (*Prosopium williamsoni*), and northern pike minnow (*Ptychocheilus oregonensis*) (Schwabe *et al.* 2000). Species captured along with bull trout in the Middle Fork Malheur River during surveys in 2000, included brook trout (*Salvelinus fontinalis*), redband/rainbow trout, mountain whitefish, bridgelip suckers, speckled dace (*Rhinichthys osculus*), longnose dace (*R. cataractae*), sculpin (*Cottus spp.*), and redside shiner (*Richardsonius balteatus*) (Schwabe *et al.* 2001). A list of fish species found in the Malheur River Basin is presented in Appendix A.

DISTRIBUTION AND ABUNDANCE

Status of Bull Trout at the Time of Listing

Buchanan *et al*. (1997) classified bull trout in the North Fork Malheur River as "of special concern" and in the Upper Malheur River as at "high risk" of extinction. Categories of increasing extinction risk ranged from "low risk of extinction" to "probably extinct". Placement in each category was determined based on relative abundance, the severity of factors suppressing the population (for example, habitat conditions and presence of brook trout), and the potential of the population to recover to a healthy condition (Ratliff and Howell 1992). The category "of special concern" falls between a "low" and "moderate" risk level.

At the time of listing, the U.S. Fish and Wildlife Service considered all bull trout subpopulations in the Malheur Recovery Unit as "depressed" (63 FR 31647). Although subpopulations were an appropriate unit upon which to base the 1998 listing decision, the recovery plan has revised the biological terminology, to better reflect both current understanding of bull trout life history and conservation biology theory. Therefore, subpopulation terms will not be used in this chapter.

Current Distribution and Abundance

Bull trout are found in the North Fork Malheur River subbasin and in the upper Malheur River mainstem and tributaries upstream of the town of Drewsey. They are considered two distinct local populations because of their geographic isolation from construction of dams without fish passage on the mainstem Malheur River and North Fork Malheur Rivers.

North Fork Malheur River. Spawning and rearing takes place in the mainstem and tributaries upstream of Crane Crossing in the North Fork Malheur River. Results from studies of radio-tagged fish (18 tagged in Beulah Reservoir in 1999) showed that bull trout moved upstream from overwintering areas in Beulah Reservoir into the river from mid-April until late May in 1999 (Schwabe *et al.* 2000), and in 2000, some were observed in the river by mid-March (Schwabe *et al.* 2001). By June tagged fish were well distributed in the North Fork Malheur between Beulah Reservoir and the spawning areas. By early August the majority of tagged fish had moved upstream of Crane Creek confluence at river mile 42.8 (river kilometer 69) and some had moved into spawning tributaries by mid-July. The peak for migration into spawning tributaries occurred by mid to late-August. The peak in adult downstream

migration from spawning tributaries occurred in late September and bull trout returned to the reservoir between late October and mid-December (Schwabe *et al.* 2000 and 2001).

Spawning surveys were initiated in the North Fork Malheur subbasin in 1992 in streams with known or suspected bull trout populations (Buchanan *et al.* 1997). Based on data collected since 1992, bull trout spawning begins in late August and peaks in September. Redds have been observed as late as November (Schwabe *et al.* 2000). Spawning has been documented in the mainstem North Fork Malheur upstream of the mouth of Deadhorse Creek and in the following tributaries: Horseshoe Creek, Swamp Creek, Sheep Creek, Elk Creek, Crane Creek, and Little Crane Creek. Bull trout have been observed in Cow Creek during spawning surveys, but no redds have been found (Schwabe *et al.* 2000).

Subadult rearing and adult foraging occurs from the headwaters of the North Fork Malheur River down to, and in, Beulah Reservoir. In August of 1997, an interagency team of biologists snorkel surveyed the North Fork Malheur River from the confluence of the North Fork and Little Malheur Rivers upstream to the National Forest boundary. They documented bull trout rearing down to the confluence of the Little Malheur River. Sizes of bull trout ranged from 50 to 400 millimeters (2 to 16 inches) in length with the majority in the 100 to 200 millimeter (4 to 8 inch) size range. The largest bull trout observed was in the 300 to 400 millimeter (12 to 16 inch) size range (A. Miller, U.S. Forest Service, pers. comm. 2002). Trapping of subadult[1] bull trout during 1998 and 1999 using a rotary screw trap and passive integrated transponder (PIT) tags showed bull trout migrating downstream from spawning and rearing areas (upstream of Crane Creek) in the North Fork Malheur River. During the period the trap was operated (June to October) two peaks in migration were observed, the largest in June, and another smaller one in September. The smallest bull trout trapped in Beulah Reservoir during 1998 and 1999 measured 220 millimeters, or 8 to 9 inches in length (Schawbe *et al.* 2000).

Most radio-tagged bull trout overwintered in Beulah Reservoir. Some bull trout exit Beulah Reservoir during flood control operations, as well as during the irrigation season and are lost to the population above the dam. The extent of use and survival of bull trout in the mainstem Malheur River downstream of Agency Dam is unknown. During the 1999 study, five bull trout

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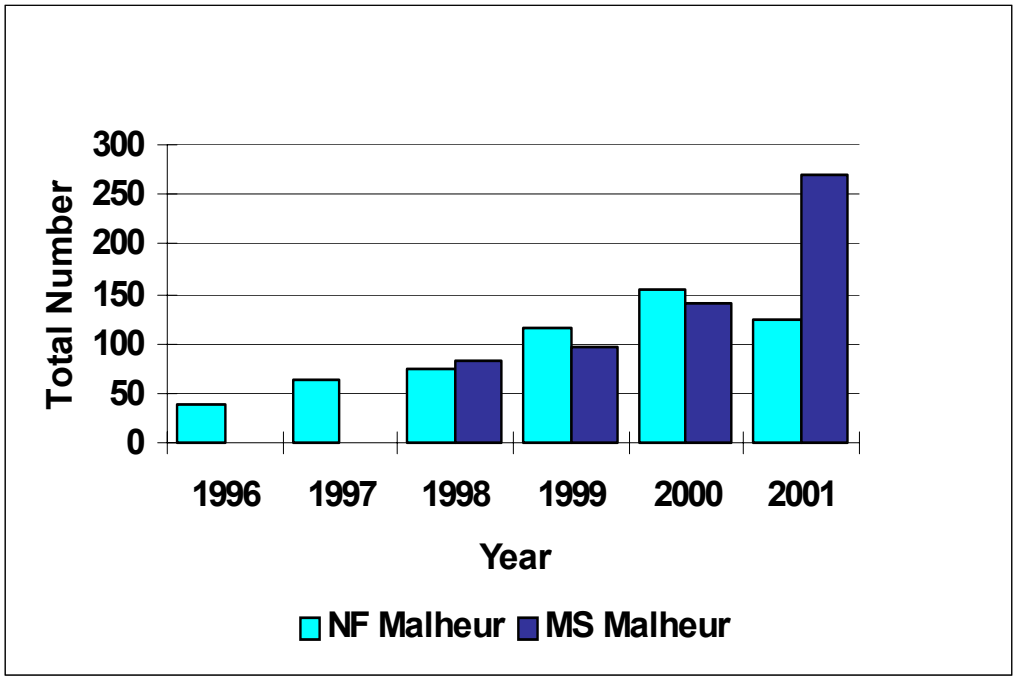
Fish were classified as subadult based on scale analysis that showed most fish to be age 3 or 4. Age 3 fish ranged in fork length from 168 to 260 millimeters (7 to 10 inches), while age 4 fish ranged in fork length from 214 to 315 millimeters (8 to 12 inches) (Schwabe *et al.* 2000).

were fitted with radio tags and released below the dam. Most of the radio-tagged bull trout stayed within 1.5 kilometers (1 mile) of the dam during the study period (Schwabe *et al.* 2000).

Redd surveys are used to track bull trout trends in abundance in the Malheur River Basin. A general upward trend in redd numbers has been observed since 1992. Redd counts from 1996 to the present are shown in Figure 2. Survey areas and timing have been standardized since 1996, so these data represent the most accurate estimate of trend available (Tinneswood and Perkins 2001).

Figure 2. Bull trout redd counts in the North Fork Malheur subbasin 1996 to present.



In 2000, surveyors observed 29 redds with 2 or more bull trout on them, or 19 percent of the total redds counted (151). The number of bull trout observed on a single redd ranged from one to five, or approximately 2.4 bull trout per redd (Tinneswood and Perkins 2001). This represents the maximum bull trout per redd ratio recorded for the North Fork Malheur River local population. In 2001, when fewer redds and bull trout were counted, the ratio was closer to 2.0 (R. Perkins, Oregon Department of Fish and Wildlife, pers. comm. 2002). These ratios along with redd counts for the period 1996 to 2001were used to estimate

abundance of adult bull trout in the North Fork Malheur (Table 1). An estimate of 4,132 bull trout age at least one year old for the North Fork Malheur River is based on population sampling completed in 1991 and 1992 using a multiple pass removal method (Buchanan *et al.* 1997).

Table 1. Estimates of adult bull trout abundance in the North Fork Malheur, 1996 to 2001.

Year	Redds	Range of Abundance
1996	38	76 to 91
1997	64	128 to 154
1998	74	148 to 178
1999	115	230 to 276
2000	153	306 to 367
2001	125	250 to 300

Upper Malheur River. Bull trout spawning and juvenile rearing occurs in the Upper Malheur River and tributaries upstream of the confluence of Big Creek. Streams where redds have been identified include Snowshoe Creek, Meadow Fork Big Creek, Lake Creek, Summit Creek, and Big Creek, although brook trout may account for some of the redds.

Timing of bull trout spawning in the Upper Malheur population is similar to what has been observed in the North Fork Malheur population with the peak occurring in mid-September. Data collected in 1999 showed that 40 percent of the redds were counted prior to September 15th. These redds were assumed to be bull trout redds as they occurred in streams where most of the bull trout were also observed, although brook trout were present during surveys (Schwabe *et al.* 2000).

Subadult rearing and adult foraging occurs downstream to approximately river kilometer 286 (river mile 178) in the vicinity of Hog Flat, based on limited historical and recent radio-telemetry documentation (Schwabe *et al.* 2001), and one radio-tagged fish was tracked to near the mouth of Wolf Creek in the spring of 2002 (W. Bowers, Oregon Department of Fish and Wildlife, pers. comm. 2002). It is possible, although not documented, that fish forage as far downstream as Warm Springs Reservoir during winter.

A general upward trend in redds counted in the Upper Malheur River has been observed for the period of record, 1998 to present. However, an estimate of adultabundance for the Upper Malheur River local population is not available at this time because of the inability to distinguish between bull trout and brook trout redds when not occupied.

Oregon Department of Fish and Wildlife estimated the bull trout population at 3,554 bull trout at least one year old, based on population sampling in 1993 and 1994 in Big Creek, Lake Creek, and the Meadow Fork of Big Creek. Densities ranged from a high of 0.474 fish per lineal meter (762.8 fish per mile) in Meadow Fork of Big Creek to a low of 0.039 fish per lineal meter (62.8 fish per mile) in Lake Creek (Buchanan *et al.* 1997).

REASONS FOR BULL TROUT DECLINE

Threats to bull trout arise from the modification or destruction of their habitat or from direct take (*e.g.*, harvest, disease, injury, etc.). Fish habitat in the Malheur Recovery Unit has been altered significantly since European settlement, affecting not only bull trout, but anadromous species as well. Salmon and steelhead are considered an important part of the historical prey base for bull trout. Historical land uses affecting bull trout habitat in the Malheur Basin include livestock grazing, timber harvest, road building, dispersed recreation, and irrigated agriculture. Liberal harvest regulations and fish stocking programs have also been implicated in the decline of bull trout (Buchanan *et al.* 1997).

Prior to the construction of dams, bull trout in the Malheur River had access to the Snake River, although their typical summer habitat was in the upper part of the basin. The lower reaches of the Malheur River are considered too warm in the summer for bull trout rearing and spawning, but did serve as a migration corridor to the Snake and Columbia Rivers, and as foraging habitat during winter. At the time of listing, the U.S. Fish and Wildlife Service identified forestry, grazing, agricultural practices, water quality, and introduced species (brook trout) as threats to Malheur River bull trout (63 FR 31647).

Subwatersheds in the Malheur River Basin were assessed by the Malheur-Owyhee Watershed Council using the Proper Functioning Condition methodology developed by the Bureau of Land Management (1995) to evaluate the streams based on their capability and potential to collect, store, and release water in a beneficial manner. Based on subbasin assessments, the mainstem Malheur River upstream of Warm Springs Dam was judged to be in fair condition with some channel incision and bank erosion upstream of Warm Springs Reservoir, primarily in the Drewsey and Logan Valleys. In these areas the channel has been altered to facilitate agriculture and to some extent road building (Malheur-Owyhee Watershed Council 1999). Only the upper reaches in the North Fork Malheur River Subbasin have been assessed thus far, and they were judged to be in fair to good condition. Evidence of streambank erosion in some areas between Beulah Reservoir and Crane Creek may be natural or resulting from activities occurring upstream (Malheur-Owyhee Watershed Council 1999). Downstream of Beulah Dam the North Fork Malheur River has been channelized in one section and altered by agriculture and road building in two other sections (Malheur-Owyhee Watershed Council 1999). The Malheur River from Warm Springs Dam downstream to the mouth is, “incised along much of its length with exposed actively eroding streambanks” (Malheur-Owyhee Watershed Council 1999) and constrained for much of its length by a highway and railroad bed.

Temperature is the most serious water quality parameter affecting bull trout in the Malheur Basin based on the Department of Environmental Quality 303d list (Table 2). Sediment loading has been observed in the North Fork Malheur River both upstream and downstream of Beulah Reservoir and downstream of Warm Springs Dam during spring runoff and local storm events (Malheur-Owyhee Watershed Council 1999).

Table 2. List of bull trout streams on the 303(d) list that exceed the bull trout temperature standard.
(Source: http://www.deq.state.or.us/wq/WQLData/SubBasinList98.asp)

Waterbody Name	Boundaries
Big Creek	Mouth to Meadow Fork
Crane Creek	Mouth to Little Crane Creek
Elk Creek	Mouth to Headwaters
Lake Creek	Mouth to Headwaters
Little Crane Creek	Mouth to Headwaters
Malheur River, North Fork	Crane Creek to Headwaters
Sheep Creek	Mouth to Headwaters
Swamp Creek	Mouth to Headwaters

Other parameters listed for stream segments downstream of currently occupied bull trout habitat include bacteria, chlorophyll-a, and toxics (http://www.deq.state.or.us/wq/WQLData/SubBasinList98.asp). Most of the water quality issues have resulted from both historical and current land use activities in the basin. However, summer stream temperatures were likely limiting due to natural conditions, especially during hot, dry periods with low precipitation.

Dams

Construction and operation of Agency Dam/Beulah Reservoir and Warm Springs Dam and reservoir has fragmented Malheur Basin bull trout local populations, altered the stream temperature and streamflow regimes, halted migration of anadromous species and their nutrient inputs, altered forage bases, and in the case of Agency Dam, entrained bull trout during spring and summer (U.S. Bureau of Reclamation (USBOR) 1998, Hanson *et al*. 1990; Schwabe *et al.*

2000). Releases of water in the spring are through the spillway radial gates. Four of 39 bulltrout radio-tagged above Beulah Reservoir were entrained through Agency Dam (Schwabe *et al.* 2000).

Neither dam was constructed with fish passage, nor were conservation pools included for fish. During drought years there is insufficient water to hold overwintering bull trout in either reservoir, although use by bull trout has not been documented in Warm Springs Reservoir. The reduction in reservoir volume also affects production of aquatic organisms and forage species important to bull trout, although the prey base would be more concentrated and more vulnerable to predation. At low reservoir levels, bull trout are likely entrained through the outlet works and are lost to the population (USBOR 1998). The extent of entrainment through the dam outlet works and the resulting effect on the adfluvial bull trout population is unknown at this time.

At the end of the irrigation season releases from both dams cease. Fish that survive entrainment are stranded in pools downstream. Data from a few fish radio-tagged in the pool below the dam show they remained within 2 kilometers (about 1 mile) of the location where they were tagged (Schwabe *et al.* 2000). During the winter dams do not release water so the reservoirs can refill. Lack of flows in the North Fork Malheur downstream of Beulah Reservoir is an issue from October 15 until spring when the reservoir fills and spills or irrigation season begins. In the absence of entrainment data for Agency Dam, the U. S. Fish and Wildlife Service estimates the expected level of take to be at least seven percent of the total population present in the reservoir. This is based on the entrainment rate determined at Arrowrock Dam (on the Boise River in Idaho), which was the only entrainment data available for a Bureau of Reclamation facility (USFWS 1999).

Habitat below dams is deprived of gravel and wood inputs that are trapped behind the dams. Streambank stability and riparian habitat may be negatively affected by extended surges in flows released during peak irrigation demands (Malheur-Owyhee Watershed Council 1999).

Agency Valley Dam and Beulah Reservoir have created an environment which supports adfluvial bull trout. These fish are probably larger than they would have been historically because of the abundant food supply present in the reservoir environment. Water temperatures downstream of Beulah are probably cooler than they were historically because the releases come from the deepest portion of the reservoir where water is coolest (R. Rieber, *in litt.* 2000).

Forest Management Practices

The following discussion pertains primarily to public lands as there is little data available on forest management practices on private land. Best Management Practices recommended by the Oregon Department of Forestry under the Oregon Forest Practices Act (ORS 527.610 to 527.770, 527.990(1) and 527.992) and Forest Practice Administrative Rules (OAR 629.600 to 629.665) guide forest management on private lands. Forest management practices on the Malheur National Forest affecting bull trout habitat include harvest of forest products, associated road building, and recreation activities. Livestock grazing and hay production also take place in the forested zone on public and private land, and these will be discussed in subsequent sections.

A proper functioning condition analysis for bull trout watersheds on the National Forest in the North Fork Malheur subbasin determined that streams were "functioning at unacceptable risk" and did not meet criteria for temperature, sediment, substrate embeddedness, pool frequency and quality, and large pools (USFS 1999b). A similar analysis for bull trout watersheds in the upper Malheur subbasin determined streams were "functioning at unacceptable risk" and did not meet criteria for temperature, sediment, physical barriers, pool frequency and quality, and road density and location (USFS 1999a).

The natural disturbance regime in the bull trout occupied subbasins includes some flooding associated with rain-on-snow events and wildfires ignited by late summer dry thunderstorms. Wildfires present the greatest natural threat due to conditions resulting from historical fire exclusion, management of stands in dense multi-story character, and accumulations of fuels associated with insect and disease related mortality (USFS 1999a; USFS 1999b). The Glacier, Sheep Mountain, and Snowshoe fires may have directly affected bull trout streams by increasing temperature and sedimentation (Buckman *et al.* 1992). Stream temperature data from Swamp Creek showed average maximum temperatures above 10 degrees C at sites within the fire boundary with very little vegetative cover and below 10 degrees C at the site outside the fire boundary (Perkins 2000). Major forest fires and acreage burned in recent history are shown in Table 3. Although some monitoring of sediments has occurred, additional monitoring of sediment in North Fork Malheur subbasin is needed to assess the impact of the Glacier, Sheep Mountain, and Snowshoe fires on bull trout habitat.

North Fork Malheur River. The mainstem of the North Fork Malheur River on the Malheur National Forest lacks instream wood and large wood for recruitment, as well as side channel habitat and channel complexity. Above Crane Crossing this is attributed to past fires, commercial logging, and personal

use wood cutting. Lack of large wood contributes to lack of pools, and loss of channel complexity, bank stability, and shade. Reduced sinuosity in unconstrained forested reaches outside the wilderness is attributed to lack of large wood associated with historical harvest activity (USFS 1999b).

Table 3. List of major forest fires in the upper Malheur River Basin since 1989 (USFS 1999a and USFS 1999b). Area burned is in acres/hectares

Subbasin	Fire	Year	Area Burned
Upper Malheur	Sheep Mountain	1990	2,076 / 840
Upper Malheur	Snowshoe	1990	9,285 / 3,757
North Fork Malheur	Glacier	1989	3,237 / 1,310
North Fork Malheur	Ironside	1994	5,261 / 2,129
North Fork Malheur	Monument Rock	1989	2,098 / 849
North Fork Malheur	Powder	1994	5,806 / 2,350
North Fork Malheur	Sheep Mountain	1990	8,867 / 3,588

In addition to bull trout spawning and rearing segments that exceed the bull trout temperature standard (see previous Water Quality section), temperature is also limiting in the North Fork Malheur from Crane Creek to Beulah for summer subadult and adult rearing due in part to forest management practices and irrigation withdrawals. This segment is on the 303(d) list for not meeting Oregon water quality standard for cold water species (64 degrees F) (http://www.deq.state.or.us/wq/WQLData/SubBasinList98.asp).

The road system used for timber harvest on National Forest lands within the Malheur Recovery Unit dates from the mid-1950's. Until that time a series of railroad spur lines were used to haul logs to mills in Burns and Seneca (USFS 1999b). Roads constructed along stream channels have narrowed the potential for stream channel movement (decreased sinuosity) and reduced vegetation potential in riparian areas. Twenty-six roads (16 miles) occur within Riparian Habitat Conservation Areas, a management designation whereby riparian areas are protected and enhanced for wildlife, non-anadromous fish habitat, and water quality values (USFS 1999b).

Bull trout occupied streams surveyed in the upper North Fork Malheur River show fine sediment estimates ranging from 31 percent to 40 percent (Oregon Department of Fish and Wildlife data cited in USFS 1999b). Additional studies in bull trout spawning and rearing areas should be done to isolate

sediment sources, which may include roads and burned areas (*e.g.*, Glacier Fire), and to define and prioritize remedial action.

Upper Malheur River. Passage barriers are known to exist in the upper Malheur River subbasin at road crossings on Summit Creek and at the old railroad grade crossing on Bosonberg Creek (USFS 2000). A number of road culverts on the National Forest present passage barriers as well. A forest-wide culvert inventory was conducted in thesummer of 2001. Preliminary analysis showed that many culverts would not pass juveniles under low flow conditions, although the data has not been sorted for barriers to bull trout (A. Miller, pers. comm. 2002).

Seasonal thermal barriers at the mouths of Lake, McCoy and Summit Creeks limit bull trout movement between local populations and access to potential habitat (USFS 2002). These are areas where stream gradients decrease as the streams enter natural open meadow areas. However, water diverted from streams on the National Forest to irrigate hay meadows on private land has decreased the amount of water in the streams, increasing the potential for warming (A. Miller, pers. comm. 2002).

Inputs of fine sediments from surface erosion have been attributed to timber harvest, grazing (both livestock and big game), and wildfire (USFS 1999a). Sediment in Snowshoe and Corral Creek Basins may be related to fire salvage activities following the Snowshoe Fire in 1990, while high levels of fine sediment in Lake Creek and Bosonberg Creek are road-related (USFS 2002). Contributing to the road-related sedimentation on the National Forest may be the high road densities (2.4 to 2.6 miles/square mile) where road densities are greater than stream densities (USFS 2000). This is indicative of the potential for road surfaces to alter the way water reaches the stream by increasing the runoff rate and decreasing infiltration rates. Thirty-one kilometers (19 miles) of roads are in Riparian Habitat Conservation Areas (USFS 1999a). Trail crossings on the Sheep Creek and Crane Creek trails are experiencing increased degradation of habitat (USFWS 2001), presumably from sediment loading among other impacts.

The lack of sufficient large pools may be limiting production of bull trout in the Upper Malheur subbasin. Large wood in the stream channel plays an important role in pool formation, and although large wood is considered adequate overall (USFS 2002), Lake Creek and Summit Creek wood levels are below Inland Native Fish Strategy standards (USFS 1995, USFS 1999a). Lack of pools has also been attributed to the extirpation of beaver by the mid-1850's and subsequent loss of pools created by beaver dams (USFS 2000).

Areas that need riparian restoration are identified in Table 4. Bluebucket Creek and associated tributaries has also been identified as needing riparian and stream restoration (USFS 1999a). Areas that burned in the Snowshoe and Corral Basin fires are still recovering and lack adequate shade (USFS 2002).

Livestock Grazing

Livestock grazing is a major land use activity on public and private lands in the North Fork Malheur River and Upper Malheur River subbasins. Livestock are turned
out onto public grazing allotments in the spring and summer, while private pastures are used for hay production for winter forage. Livestock are gathered in the fall and winter in riparian pastures, which in addition to trampling riparian vegetation, may also contribute to poor water quality. Impacts to bull trout habitat resulting from over-utilization of the riparian vegetation include loss of shade, which can increase stream temperature; increased bank erosion through removal of woody species and physical trampling of streambanks; and direct trampling of redds where livestock have access to spawning areas.

While much of the impact is from historical grazing practices and corrective measures have been taken, some problem areas remain on public and private lands. Unauthorized use is a continuing problem in both U.S. Forest Service and Bureau of Land Management allotments (USFWS 2001; U.S. Bureau of Land Management (BLM) 2002). Recently, wild ungulates (deer and elk) have also been implicated in the suppression of riparian vegetation (D. Young, *in litt.* 2000; USFWS 2001; BLM 2002).

Table 4. Streams with riparian areas in poor condition in Upper Malheur River subbasin (USFS 2002).

Stream Name	Ownership	Reach
Big Creek	Private	Mouth to Forest Service Road 16
Big Creek	U.S. Forest Service	Small reaches from Forest Service Rd 1648 to Wilderness Boundary
Malheur	Private, U.S. Forest Service	Malheur Ford to Big/Lake confluence
Showshoe Creek	U.S. Forest Service	Upper reach (Snowshoe Fire)

Table 4. Streams with riparian areas in poor condition in Upper Malheur River subbasin (USFS 2002).

Stream Name	Ownership	Reach
Corral Basin Creek	U.S. Forest Service	Mouth to headwaters
Bosonberg Creek	Private	Mouth to Forest Service Rd 16
Bosonberg Creek	U.S. Forest Service	Upper reach (Snowshoe Fire)
Lake Creek	Private, U.S. Forest Service	Mouth to Forest Service Rd 16
McCoy Creek	Private	Mouth to FS Boundary
Summit Creek	U.S. Forest Service, Private	Mouth to North end of Summit Prairie
Crooked Creek	U.S. Forest Service	Mouth to Headwaters

North Fork Malheur River. Lack of riparian habitat from grazing is a limiting factor in the North Fork Malheur River downstream of Crane Crossing to Beulah Reservoir and from Agency Dam to the mouth of the river, primarily on the private lands. Vegetation is routinely removed by ranchers to facilitate livestock operations (Malheur-Owyhee Watershed Council 1999). During spawning surveys on Elk Creek from 1997 to 2000, cattle were present (Tinneswood and Perkins 2001). Presence of sheep in Swamp Creek and cattle in Little Crane Creek, both important bull trout spawning tributaries, was noted during 1999 spawning surveys (Schwabe *et al.* 2000).

Upper Malheur River. Lack of riparian habitat is a problem in the Malheur River between Malheur Ford and Bosonberg Creek and in the lower reaches of Bosonberg, Big, Lake, Corral Basin, and McCoy Creeks. Streams on private lands in Logan Valley and Summit Prairie have altered stream channels and flows as a result of livestock grazing and water withdrawals (USFS 1999a). Riparian and stream channel restoration is needed on Bluebucket Creek and its tributaries (USFS 1999a). Sedimentation from grazing is a problem in the Malheur River downstream to the Drewsey Valley. Downstream of Highway 20 the channel is aggrading. This could be due to excessive sediment inputs upstream of the highway from bank erosion as a result of poor grazing practices.

Agricultural Practices

Water is diverted from both forks of the Malheur River for stock water and irrigation of hay meadows. Many of the diversions originating on the National Forest are held by private landowners and are small spring sources for domestic water sources and irrigation (USFS 1999a). Not all diversions have been inventoried. From the mouth of the North Fork Malheur River to the confluence with the Snake River, the Malheur River flows through intensively managed agricultural lands where water quality and water quantity issues magnify. The Malheur River downstream of Namorf Dam to the mouth is not currently considered suitable migration habitat for bull trout because of water quality and passage issues.

Stream temperature may be affected by diversions as well as by surface releases from Beulah Reservoir. Diverted water reduces available instream habitat can result in increased stream temperature, and also creates migration barriers.

Where diversions are unscreened, fish can become entrained in the irrigation ditches and perish. There are four unscreened diversions in the North Fork Malheur River subbasin upstream of Beulah Reservoir and six or more downstream of the dam. Some of the diversions above the Drewsey Valley in the upper Malheur River subbasin are screened, however none are screened from the upper Drewsey Valley downstream. Some irrigation diversions in the Drewsey Valley are also passage barriers. The diversion at Namorf Dam is not screened, nor are any of the diversions downstream to the mouth ofriver screened (R. Perkins, pers. comm. 2002). During the early spring virtually all of the river is diverted at Namorf Dam into the canal to fill Bully Creek Reservoir (W. Bowers, pers. comm. 2002).

Transportation Network

Most of the threats associated with the transportation network occur on the National Forest and were discussed previously under Forest Management Practices. On tribal land within the Malheur National Forest the access ford to Burn Paiute Tribe property in Logan valley is unstable and contributes excess sediment to Lake Creek. A bridge originally accessed the property, but it collapsed in 1999. The Burns Paiute Tribe's goal for restoration is to stabilize the stream banks and reduce sediments to Lake Creek by installing culverts designed to handle a 50-year flood event.

Highway 20 follows the river corridor through the canyon downstream of Juntura. Should the area be used by bull trout in the future there would always be a threat from spills of toxic materials transported on the highway.

Mining

Mining was not identified as an issue historically or currently.

Residential Development

Residential development was not identified as an issue historically or currently.

Fisheries Management

Historical fishery management with its liberal bag limits on trout (5 to 10 trout per day bag limit depending on location) were a factor in the bull trout's decline in the Malheur Basin. Currently, poaching and incidental mortality associated with sport fisheries may be a limiting factor in the recovery unit. Bull trout that are entrained at Agency Dam and remain in the plunge pool are vulnerable to harvest.

Another practice that may have impacted bull trout was the chemical treatment to eliminate fish from many stream segments upstream of Beulah and Warm Springs Reservoirs. Some bull trout mortalities were observed (Bowers *et al.* 1993). These areas were then planted with hatchery rainbow trout. Table 5 lists chemical treatment projects in the basin.

The fish toxicant most often used is rotenone, a natural substance derived from the roots of several South American plants. It acts by entering the blood stream of thefish through the gills and preventing oxygen use at the cellular level. In addition to fish, benthic invertebrates, zooplankton, and to a lesser extent, amphibians, are susceptible to rotenone. Mammals, birds, and plants are not directly affected, but may be influenced indirectly by the removal of fish and other organisms from the biological community. Mammals and birds can drink treated water without adverse effects (California Department of Fish and Game 1985).

Introduced brook trout are a limiting factor in the upper Malheur River where bull trout x brook trout hybrids have been identified (the North Fork Malheur does not contain brook trout). Brook trout compete with bull trout for food, cover, and spawning areas and hybridize with bull trout. Gunckel (2000)

Table 5. Chemical treatment projects in the Malheur Recovery Unit. Adapted from Bowers *et al.* (1993).

Subbasin	Year	Areas treated
North Fork Malheur	1950	Beulah Reservoir
	1955	North Fork Malheur River tributaries and Beulah Reservoir
	1961	Beulah Reservoir and tributaries, mainstem Malheur River from mouth of Crane Creek to Beulah Reservoir
	1968	Beulah Reservoir and lower sections of tributaries, Little Malheur River
	1977	North Fork Malheur River 8 kilometers above Beulah Reservoir and the reservoir
	1987	North Fork Malheur River from Castle Rock Ranch downstream to mouth near Juntura, Beulah Reservoir
Upper Malheur	1955	Malheur River from Dollar Basin ford downstream; Lake Creek, McCoy Creek; upper Crooked Creek; Big Creek, Bosonberg Creek; Summit Creek; other tributaries to Warm Springs Reservoir and selected reservoirs including Warm Springs

researched feeding behavior and diet of bull trout and brook trout and found that interference competition was likely due to their similar habitat use, feeding behavior and diet, and aggressive interactions between the species. The dominant behavior of brook trout place bull trout at a disadvantage when resources are scarce (Gunckel 2000). In addition, rainbow trout have been stocked in the past in the vicinity of campgrounds on public land. These fish also would have competed with bull trout for food, shelter, and space.

Unauthorized introductions of nonnative fish and other aquatic organisms are always a concern and are difficult to prevent. Bait fish are often accidentally introduced, while some introductions of game fish are intentional. The most recent unauthorized introduction occurred in Beulah Reservoir when crappie (*Pomoxis spp.*) were discovered in 2001. Impacts to the bull trout population are

unknown at this time. Efforts will be undertaken by Oregon Department of Fish and Wildlife to remove them to prevent their establishment in the reservoir.

There are no significant fish disease issues in the recovery unit at this time. Disease was not identified as threat to bull trout when they were listed. Whirling disease has been present since the 1980's in the Grande Ronde Basin, which also has several local populations of bull trout. However, bull trout there do not exhibit signs of the disease. Periodic sampling for whirling disease is a necessary fish management tool to monitor and detect any spread of the disease.

Bull trout may be inherently resistant to some diseases that are more devastating to other salmonids. In challenge studies conducted by Oregon State University researchers, Metolius (Deschutes) bull trout exposed to high and low doses of the infectious stages of *Myxobolus cerebralis* (causative agent in whirling disease) showed no signs of infection as measured by presence of spores, clinical disease signs, or histopathology. Rainbow trout exposed simultaneously showed high infection prevalence and disease severity. Nor were infections detected in Metolius (Deschutes) bull trout exposed to infection by *Ceratamyosis shasta* (Bartholomew 2001). Disease studies conducted on bull trout from the Deschutes River Basin showed them to be relatively resistant to all strains of Infectious Hematopeietic Necrosis Virus tested. Bull trout had detectable levels of antigen to *R. salmoninarum* (bacterial kidney disease) but no evidence of the disease.

Isolation and Habitat Fragmentation

As previously discussed in the "Dams" section, the two populations in the Malheur River Basin are isolated from one another by the Agency and Warm Springs Dams. Other passage barriers exist that prevent gene flow among local populations within the two subbasins and inhibit expansion of local populations into potential bull trout habitat (*i.e.*, culverts, diversions, and thermal barriers). Losses to the local populations when bull trout are entrained at Agency Dam and in unscreened irrigation diversions or through natural catastrophic events, such as drought and wildfire, have impacted bull trout numbers, although losses are difficult to quantify. When a bull trout population size is small such losses increase the probability of extinction (Rieman and McIntyre 1993). Recovery and long-term persistence of bull trout in the Malheur Recovery Unit is dependent on reconnecting the two isolated local populations. Therefore, the most critical challenges facing Malheur Basin bull trout are eliminating the threat of brook trout in the upper Malheur subbasin and providing opportunities for passage at Agency and Warm Springs Dams.

ONGOING RECOVERY UNIT CONSERVATION MEASURES

Efforts to recover bull trout and fish habitat in general are ongoing in the Malheur Recovery Unit with a high level of cooperation between fishery entities on various projects. For example, the Oregon Department of Fish and Wildlife, the Burns Paiute Tribes, U.S. Bureau of Land Management, U.S. Forest Service, and the Bureau of Reclamation staff work have worked cooperatively on bull trout spawning and habitat surveys for many years. The Malheur River Basin has several active local watershed groups and conservation districts dedicated to finding workable solutions to restoring watershed health. The following list is by no means complete, but is representative of ongoing efforts within the recovery unit.

Oregon Department of Fish and Wildlife

The Oregon Department of Fish and Wildlife has reduced or eliminated hatchery rainbow and brook trout stocking programs; adopted changes in angling regulations to prohibit take of bull trout in 1992, modified regulations on other fisheries to reduce incidental take; made changes to in-water work periods to better address bull trout needs; and has applied for Instream Water Rights on ten stream segments to benefit bull trout (Appendices C and D). Stream priorities for additional acquisition of instream water rights are also shown in Appendices C and D.

The agency has also developed and distributed bull trout identification posters to provide better public awareness education. Large metal signs were installed in 2000 at major entry points in the recovery unit where people might encounter bull trout.

A multi-year bull trout research project was initiated by the Oregon Department of Fish and Wildlife in northeastern Oregon in 1995 to study bull trout life history, ecology, and genetics. Funding has been provided through a grant from the Bonneville Power Administration. Part of the research project examined brook trout and bull trout interactions in the Middle Fork Malheur. Oregon Department of Fish and Wildlife also has obtained funding through a cooperative agreement with the U.S. Fish and Wildlife Service (section 6) funding to assist with spawning surveys to monitor bull trout populations.

Planning efforts in the Oregon Department of Fish and Wildlife have focused on formation of local bull trout working groups to develop conservation strategies for Oregon bull trout populations. This effort was begun in 1993 and these working groups were later used to form the foundation for bull trout

recovery unit teams in Oregon. Bull trout distribution mapping using the agency's Geographic Information System began in 1996. The statewide bull trout assessment, Status of Oregon's Bull Trout (Buchanan *et al.* 1997), was published in 1997.

Oregon State Police

Bull trout remain a high priority for enforcement through the Oregon State Police Cooperative Enforcement Program. Staff from Oregon State Police and Oregon Department of Fish and Wildlife meet annually to set priorities for enforcement in the Malheur Recovery Unit through the Cooperative Enforcement Program.

Bureau of Reclamation

The Bureau of Reclamation is actively engaged in a number of studies resulting from a U.S. Fish and Wildlife Service biological opinion for operation and maintenance of Bureau of Reclamation projects (*i.e.*, Beulah and Warm Springs Reservoirs) in the recovery unit. Investigations are focused on water quality, safety of dams, water acquisitions, conservation pools, and fish passage. The Bureau of Reclamation has initiated or committed to the following studies.

In August 1997, the Bureau of Reclamation entered into a cooperative agreement with the U.S. Forest Service, Bureau of Land Management, Oregon Department of Fish and Wildlife, and the Burns Paiute Tribe to investigate the distribution and abundance of bull trout in the North Fork Malheur River basin from Beulah Reservoir to the headwaters. The study involves radio telemetry for up- and downstream migrating juvenile and adult bull trout and a continuation of surveys of bull trout spawning grounds. In 1999, bull trout were captured below Agency Valley Dam, radio-tagged, and monitored to determine the potential for entrainment through the dam.

Water quality monitoring/modeling studies were initiated in 1999 by the Bureau of Reclamation to determine the minimum pool elevation necessary to support adfluvial bull trout. Bi-monthly field sampling for water quality and limnology study was conducted in 1999 and 2000. The data, along with a bioenergetics model being developed for bull trout by the U.S. Geological Survey, will be used to develop a reservoir model to quantitatively define the effects of various pool elevations on dissolved oxygen depletion and winter kill during the winter months, and to determine the available habitat for bull trout during the summer thermal stratification period when existing data suggest

oxygen depletion in the deeper waters and high temperatures at the surface (R. Rieber, U.S. Bureau of Reclamation (BOR), pers. comm. 2002).

In 2000, the Bureau of Reclamation starting releasing up to 650 cubic feet per second (18 cubic meters per second) of water through the outlet works from the bottom of Beulah reservoir and not the spillway to test if this will reduce entrainment of bull trout. The spillway is only operated if releases greater than 650 cubic feet per second (18 cubic meters per second) are required as a result of flood control operations, and those are generally of short duration.

The Bureau of Reclamation has investigated alternatives for creating a minimum fisheries pool. The Beulah Reservoir Conservation Pool Appraisal study looked at three options: raising capacity at Beulah, raising capacity at Warm Springs, or building a new reservoir at Vines Canyon (near Vale) and exchanging water in it for a conservation pool at Beulah. Storing additional water behind Warm Springs Dam would be the least expensive of the options evaluated in this report if this work can be coordinated with the modification planned for Warm Springs Dam (USBOR 2001).

An appraisal-level investigation on possible upstream passage or trapping options at Agency Valley Dam is scheduled to begin in 2003, pending results from the water quality research (R. Rieber, pers. comm. 2002).

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service is engaged in ongoing section 7 consultations with the U.S. Forest Service, the Bureau of Land Management, and the Bureau of Reclamation. Biological opinions issued by the U.S. Fish and Wildlife Service cover grazing, vegetation management, and reservoir operations of the respective agencies.

The U.S. Fish and Wildlife Service has provided funding through the Partners for Fish and Wildlife Program to install fish screens above Drewsey. They have also partnered with the Natural Resources Conservation Service, the National Fish and Wildlife Foundation, Oregon Department of Fish and Wildlife, Oregon Watershed Enhancement Board, and private landowners to implement a variety of projects that will directly benefit bull trout habitat. These projects include fish screens, modification of water diversions, riparian fencing, water conservation projects, and other actions to improve instream and passage conditions. This area has been identified as a geographic priority area under the Environmental Quality Incentive Program under the U.S. Department of Agriculture Farm Bill.

U.S. Forest Service and U.S. Bureau of Land Management

The U.S. Forest Service and Bureau of Land Management have taken steps to improving grazing management in the recovery unit. Changes in season of use, setting utilization standards, fencing some areas to prevent livestock access to the streams, and increased monitoring of use and enforcement action when necessary are all strategies used to improve riparian habitat and thus improve conditions for bull trout.

The U.S. Forest Service closed their diversion on Lake Creek and is considering turning it into an instream water right. Other measures to protect and improve stream habitat over the past 20 years include road closures, riparian exclosures, hardwood planting and caging, slash riprap along streambanks, and log weir placement (USFS 1999a and 1999b).

RELATIONSHIP TO OTHER CONSERVATION EFFORTS

State of Oregon

On January 14, 1999, Governor Kitzhaber expanded the Oregon Plan for Salmon and Watersheds (State of Oregon 1997) to include all at-risk wild salmonids throughout the State through Executive Order 99-01. The goal of the Oregon Plan is to, "restore populations and fisheries to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits." Components of this plan include (1) coordination of efforts by all parties, (2) development of action plans with relevance and ownership at the local level, (3) monitoring progress, and (4) making appropriate corrective changes in the future. It is a cooperative effort of State, local, Federal, tribal and private organizations, and individuals.

Oregon Department of Fish and Wildlife and Oregon Water Resources Department have established priorities for restoration of streamflow as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). The Oregon Department of Fish and Wildlife has prioritized streamflow restoration needs by ranking biophysical factors, water use patterns, and the extent that water limits fish production in a particular area. Oregon Water Resources Department watermasters will incorporate the priorities into their field work activities as a means to implement flow restoration measures. The needs priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects. Watershed councils and other entities may also use the needs priorities as one piece of information to determine high priority restoration projects. Bull trout occupied streams in the recovery unit are included in the highest priority designation for streamflow restoration (NWPPC 2002).

Opportunities to convert existing out-of-stream flows to instream flows in Oregon are available through a variety of legislatively mandated programs administered by Oregon Water Resources Department, such as transfers of type and place of use (ORS 536.050(4)), voluntary written agreement among water users to rotate their use of the supply to which they are collectively entitled (ORS 540.150 and OAR 690-250-0080), allocation of "conserved water" to instream use (ORS 537.455 to 537.500), lease of all or a portion of consumptive water rights to instream purposes (ORS 537.348, OAR 690-77-070 to 690-77-077), exchange of a water right for an instream purpose to use water from a different source, such as stored water, surface, or ground water (ORS 540.533 to 540.543), and substitute a ground water right for a primary surface water right (ORS

540.524). Oregon Water Trust provides purchase of water rights from willing landowners for conversion to instream water rights.

Through the Malheur River Basin Total Maximum Daily Load process a water quality management plan will be developed to address forest, agricultural, urban, and transportation sources of water quality impairment. Monitoring is scheduled to begin in the summer of 2003, which will likely delay development of the Total Maximum Daily Load scheduled for that same year (D. Butcher, Oregon Department of Environmental Quality, pers. comm. 2002). (*See* also http://waterquality.deq.state.or.us/wq/TMDLs/TMDLs.htm for more information.)

The Agricultural Water Quality Management Program, established through the Senate Bill 1010 process (ORS 568.900 through 568.933), addresses water pollution associated with agricultural lands and activities. The Malheur River Basin Agricultural Water Quality Management Area Plan was drafted in 2001. Major areas of concern include (1) pollution control and waste management (excessive concentrations of nutrients, particularly nitrogen and phosphorus, in surface water), (2) sediments carried in irrigation return flows, (3) riparian area management to restore vegetation, (4) improved streambank stability, and (5) rangeland and pasture management to improve water infiltration rates. Actions to address resource concerns will be through voluntary efforts of individual landowners with technical assistance provided to landowners through the Natural Resources Conservation Service (NRCS). A monitoring plan will be implemented to characterize baseline conditions, track plan implementation and evaluate plan effectiveness (ODA 2001).

Burns Paiute Tribe

The Burns Paiute Tribe has obtained funding through the Bonneville Power Administration Fish and Wildlife Program for a multi-year research project to learn more about the life history of bull trout and other native salmonids in the Malheur River Basin. The project is part of a cooperative effort toward bull trout recovery that includes participation by other members of the Malheur Recovery Unit Team. The Tribe has also acquired several ranch properties (with Bonneville Power Administration mitigation funding and assistance from The Nature Conservancy) that include sections of the North Fork, South Fork and Malheur River mainstem. The ranch properties will be restored to improve habitat for fish and wildlife (Northwest Power Planning Council 2002).

Local Planning Efforts

There are two active watershed councils in the Malheur River Basin, the Malheur-Owyhee Watershed Council and the Bully Creek Watershed Council. The Malheur-Owyhee Watershed Council was formed in 1995, with the mission "To lead the effort to conserve, protect and enhance all watershed resources for optimum economic and environmental benefits within the Malheur watershed". Theycompleted the Malheur Basin Action Plan in 1999 to provide local guidance and solutions for meeting State and Federal mandates, primarily the Clean Water Act and the Endangered Species Act (Malheur-Owyhee Watershed Council 1999).

Both the Harney and Malheur Soil and Water Conservation Districts work with local private landowners in partnership with the Natural Resources and Conservation Service and Farm Services Agency to implement conservation activities on private land.

Northwest Power Planning Council's Subbasin Planning

As part of the Pacific Northwest Electric Power Planning and Conservation Act of 1980, the Bonneville Power Administration has the responsibility to protect, mitigate and enhance fish and wildlife resources affected by operation of Federal hydroelectric projects in the Columbia River and tributaries. The Northwest Power Planning Council develops and coordinates the Columbia River Basin Fish and Wildlife Program that is implemented by the Bonneville Power Administration, U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Federal Energy Regulatory Commission. Coordination of Bonneville Power Administration's responsibilities for protection, enhancement, and mitigation and incorporation of recommendations by the Northwest Power Planning Council is in part accomplished through the development of subbasin summaries, which identify the status of fish and wildlife resources, limiting factors, and recommended actions at the subbasin level.

The Draft Malheur Subbasin Summary (NWPPC 2002) encompasses the Malheur Recovery Unit, and is consistent with bull trout recovery planning efforts to identify limiting factors. The draft subbasin summary identifies dams, unscreened irrigation diversions, reduced instream flows, poor water quality, loss of shade and channel structure and function, nonnative species, sediment from roads, past fisheries management (including liberal harvest limits, stocking of nonnative trout, and chemical treatment projects), loss of beaver and beaver dam complexes, and extirpation of salmon as contributing to the decline of bull trout.

The overall fisheries goal of the Draft Malheur Subbasin Plan is, "to protect, enhance and restore where needed, resident and anadromous fish in their historical habitat". The Malheur Recovery Unit Team will continue to utilize this planning process to identify and seek funding for projects to aid bull trout recovery.